

Whitepaper

More Efficient Lab and Pharma Processes Through Automated Material Handling

How mobile manipulators and smart factory solutions connect laboratory stations, production equipment, and material flows - while reducing manual handling, contamination exposure, and the workload on employees.



-60% Manual material handling

-75% Relief for employees

For production leaders, laboratory managers, and automation teams in the U.S. pharmaceutical and life science industry.

MORE EFFICIENCY.

Challenges and Risks for Pharmaceutical and Life Science Companies with Traditional Operations

Increasing Cost Pressure and Operational Complexity

Pharmaceutical and life science companies face growing cost pressures while needing to maintain strict quality and regulatory standards.

At the same time, laboratories and production facilities must become more flexible to support changing demand, new products, and varying batch sizes.

However, many material movements are still performed manually. **The transport of samples, laboratory consumables, KLTs, and production materials is often inefficient and resource-intensive.** This ties up highly qualified employees with routine logistics tasks instead of value-adding activities.

The result is increased waiting times, bottlenecks, and reduced operational efficiency.

Limited Process Visibility and Underutilized Data

Many laboratory and production managers still do not fully utilize the operational data already available from equipment and IT systems to **identify bottlenecks and drive continuous improvement**.

Without end-to-end transparency of material flows, equipment utilization, and process performance, optimization efforts remain reactive rather than proactive. As a result, significant efficiency, productivity, and traceability improvements often remain unrealized.

Skilled Labor Shortages and Employee Workload

The shortage of qualified laboratory specialists and production personnel continues to grow. At the same time, **many critical workflows still depend on experienced employees performing repetitive transport, loading, and material-handling tasks**. This reduces productivity and increases the risk of manual errors.

In regulated environments, additional documentation and traceability requirements further increase the workload. If material movements are not digitally tracked, audit risks and administrative effort continue to rise.

Compliance and Contamination Risks

Pharmaceutical and life science environments operate under strict regulatory requirements. Manual transportation and handling of samples, laboratory bottles, microwell plates, and production materials increase the number of human touchpoints within critical processes.

Every additional manual intervention can increase contamination risk and make traceability more complex. Without standardized and digitally documented material flows, maintaining consistent compliance becomes increasingly challenging.



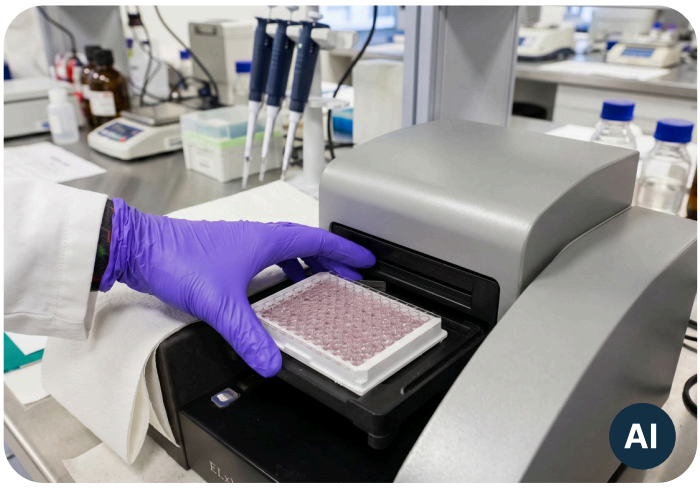
Medical Technology



Pharma & Life Science

The Status in Pharmaceutical & Life Science Operations

At the operational level, many laboratories and pharmaceutical production environments are still shaped by historically grown processes and isolated solutions. Despite modern equipment and increasing digitalization, the movement of samples, materials, and consumables between storage areas, laboratories, and production stations is often managed manually and only partially integrated.

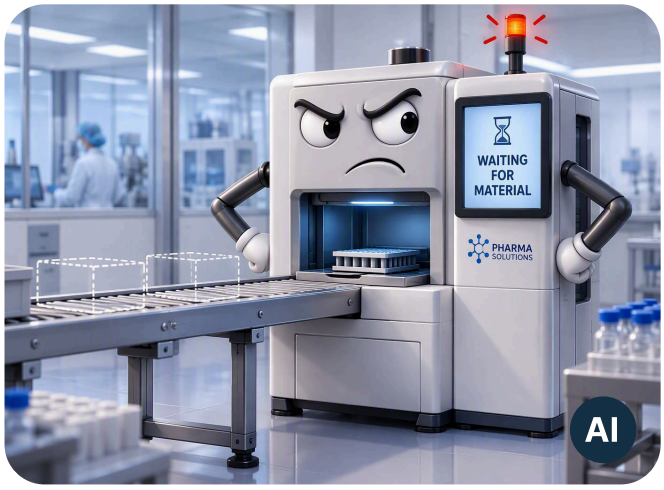


Inefficiencies and Risks Caused by Manual Material Handling

Manual material handling frequently creates inefficiencies: employees transport, identify, and move sample KLTs, laboratory bottles, cuvettes, microwell plates, and production materials between multiple workstations. Each additional manual intervention increases processing time and raises the risk of errors, contamination events, sample mix-ups, or incomplete process documentation.

Material Flow as a Critical Lever for Throughput and Productivity

Laboratory and production equipment performance is directly affected by inefficient material supply processes. If samples, consumables, or production materials are not available at the right time, analyzers, shakers, centrifuges, and production machines remain idle. These avoidable delays reduce throughput, limit resource utilization, and negatively impact overall operational efficiency.





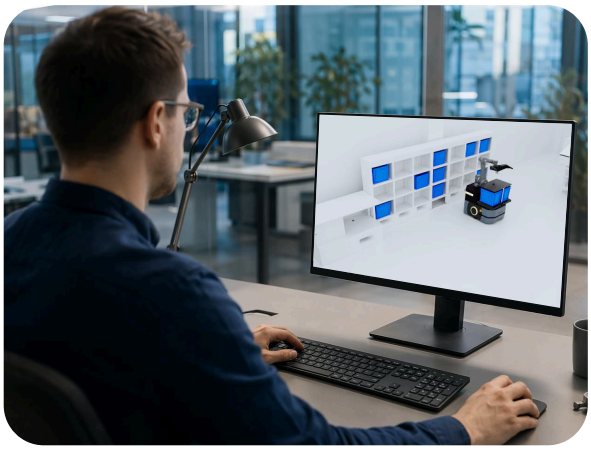
Lack of Transparency and Traceability

Due to manual documentation and disconnected systems, organizations often lack end-to-end visibility into material flows and process performance. As a result, improvement opportunities remain hidden, while the effort required for manual tracking, documentation, and compliance reporting continues to grow. This not only consumes valuable employee time but also increases the risk of gaps in traceability and audit readiness.

6 Smart Factory Elements for Higher Efficiency

Basic Principle: The Smart Lab and Smart Factory as an Orchestrated System

Effective automation connects hardware and software into an end-to-end system. In the smart factory architecture, mobile robots, stationary modules, and orchestration seamlessly integrate. This transforms individual robots into a manageable material flow from warehouse/storage to machine.



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Virtual Engineering: Planning Security Through Simulation

3D layouts create realistic **digital twins** long before implementation begins. Material flow simulations reveal bottlenecks and provide precise sizing of robotics and machines. This reduces investment risks and enables decisions based on valid data rather than assumptions.

3

mobERT®: the "last mile" from warehouse to machine

mobERT® is a **mobile manipulator** that autonomously handles material transport from the warehouse to the machine. It can load and unload the SmartShelf as well as machining centers and machines (Machine Tending).

It relieves employees from monotonous and ergonomically stressful transport and handling tasks. The goal is optimal utilization of lab and production facilities.





4 ERTmiral®: Central Fleet and Process Management

With a **central control platform** connected to MES, Scheduler systems, transport orders are planned, prioritized, and monitored in real time. This turns robots, storage, and machines into an orchestrated system instead of isolated islands.



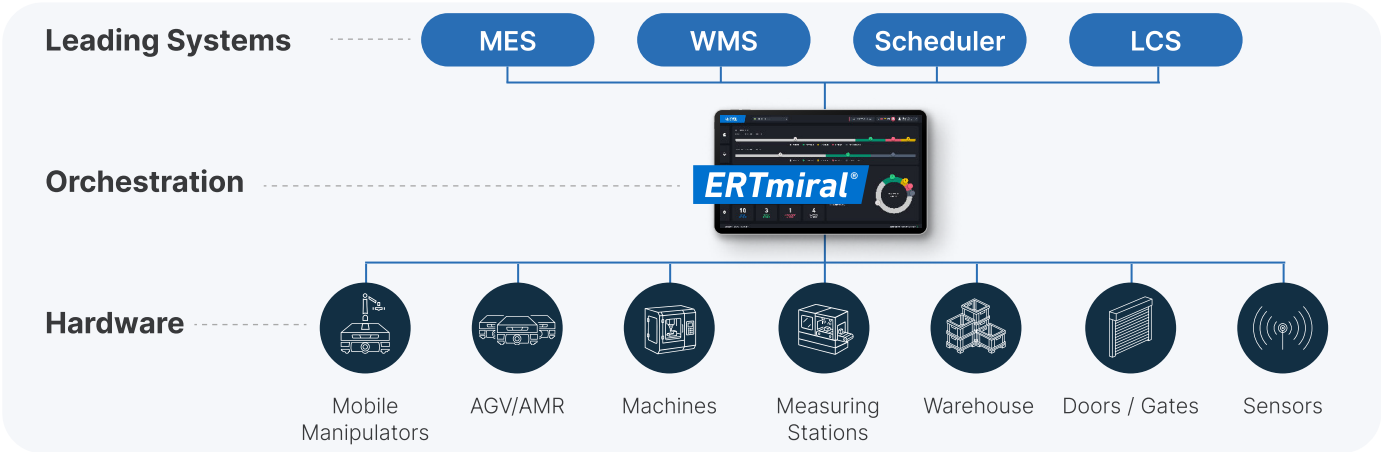
5 NEXTAGE: precise repetitive fine tasks and inspection

NEXTAGE is a **two-armed humanoid industrial robot** that reliably performs monotonous tasks 24/7. It is suitable for assembly and inspection tasks and works with both hands like a human operator. In workflows, it can be integrated via ERTmiral® – for example: mobERT® delivers parts, NEXTAGE inspects and assembles, mobERT® picks up.



6 Step-by-step rollout, safety, and scaling to additional plants

A Smart Factory and Smart Lab is consistently modular: additional mobile robots, software, or machines can be flexibly integrated without changing existing structures. Safety concepts are considered from the start – stations recognize incoming robots and automatically integrate them into existing safety logics. This keeps automation economically feasible even in brownfield sites – with scalable expansion instead of costly complete overhauls.



Benefits of Flexible Automation

- Smart Factory Solutions Integrable into Your Brownfield Use Case
- High Flexibility and Scalability of Your Automation and Smart Factory
- Automated Image Documentation of Processes via Robotic Arm Camera
- Maintaining Night Shift Through Autonomous Lights-Out Production
- Closing Staffing Gaps Through Rapid Robot Training
- Enhancing Your Company's Competitiveness and Future Viability



Efficiency Increase

Less Downtime

Productivity Increase

High Quality

Reduced Costs Due to Error Prevention



High Flexibility Down to Batch Size 1

Relieving Your Employees

Full Process Transparency





Practical Example: From Traditional Production Line to Autonomous Manufacturing for Operational Excellence

Seco Tools, part of Sandvik Machining Solutions, identified hidden wastes in the existing production setup and manufacturing processes (see right).

To further enhance their competitiveness, they initiated the transition from traditional manufacturing concepts to autonomous production.

- Employees handle products millions of times per year - often facing safety and error risks.
- Employees must make decisions impacting safety, quality, delivery time, and costs.
- Traditional concepts make it difficult to optimize sustainability, quality, costs, and delivery times.

Autonomous Production with Machine Tending



Through connected mobile manipulators and machining centers, Seco established autonomous manufacturing where machines automatically exchange order and status information with mobERT®.

mobERT® autonomously transports materials and semi-finished products between machines and loads/unloads them (machine tending) for maximum process efficiency.

Value Added by Seco

70 %

Fewer manual material transport distances for employees

75 %

Fewer decisions for employees: more relief, fewer errors

60 %

Less manual product handling - less effort, higher quality

Do you have questions?

Our Smart Factory and Smart Lab Experts are happy to offer you a non-binding and free consultation.

Contact us

You are in good company

B BRAUN

BOSCH

Seco

gerresheimer

MERCK

BASF
We create chemistry

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